

Solar Cycles - The Awesome, Mysterious, Not Yet Understood Drivers of Earth's Climate Changes

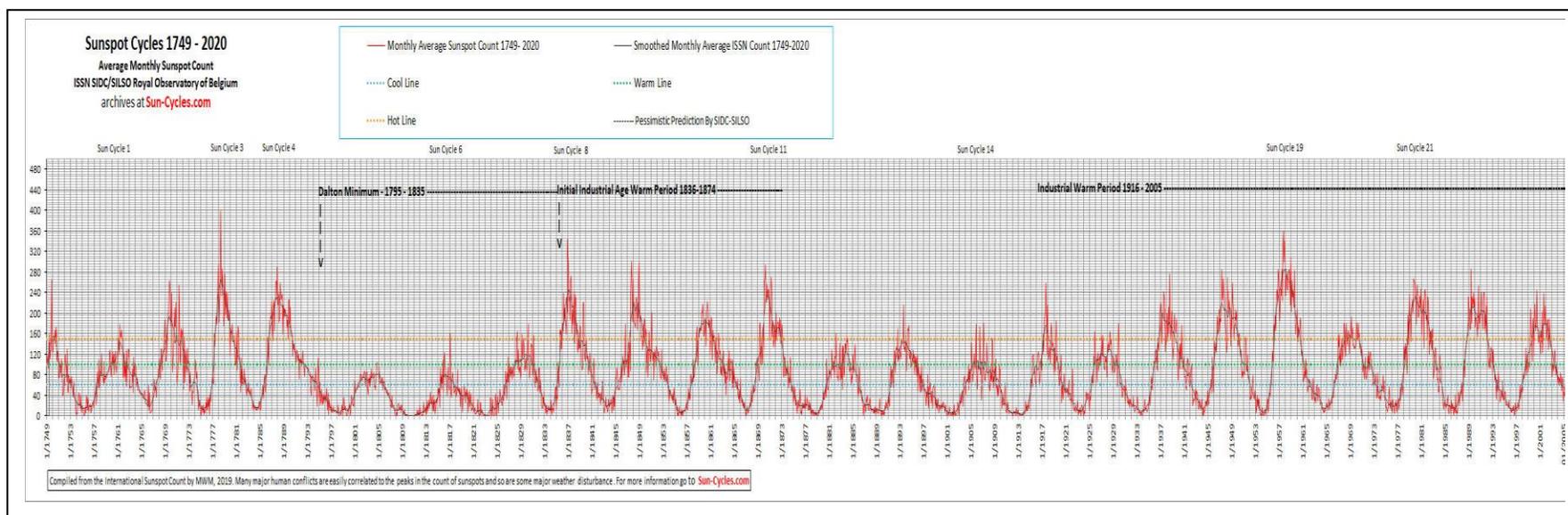
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Is the Sun going into a GRAND SOLAR MINIMUM phase to create decades of a cold climate, starting now?

Is the answer in this graph? This is our "[Super Chart of 300 Years of ISSN Sunspots](#)". It is designed to help everyone look for the influence of the Sun in their world, think about the many claims which are made about solar influence, and analyze which of the global warming/cooling predictions make the most sense (if any at all).

You can also [SEE PREDICTIONS](#) but first click on [NOTES](#) for explanation of this graph so you know what we are talking about.

[for full screen viewing of this chart, [click on this file](#) and zoom to size].



NOTES for this Page:

This is the home page matrix for the Science Section of SurviveGlobalCooling.com and for Sun-Cycles.com (Solar-Cycles.com). We have linked everything for adapting to the rapidly changing climate and weather conditions now underway at [Survive Global Cooling](http://SurviveGlobalCooling.com). This info-jammed site also many branches for teaching the fundamentals about climate change realism for all ages. For everything related to the scientific side of monitoring and understanding the climate shifts and the solar activity cycles which create them, we have linked many branches through [Survive Global Cooling/Science](http://SurviveGlobalCooling.com/Science). You can also find current sun/climate/survival news, articles, and related events through the [Sun Blog](http://SunBlog.com).

You can also find the Science section at a developmental site with a home page named SunCycles.pdf on the Earth Changes Bulletin website.

NOTES for "Super Chart of 300 Years of ISSN Sunspots"

Here is the story board for this graph. This is the foundation stone for this entire website. It is not difficult to understand, a little effort will enable you to understand the climate change issues far better than is talked about in the mass media and throughout the majority of the web.

This Super Chart is designed to help everyone look for the influence of the Sun in their world, think about the many claims which are made about solar influence, and analyze which of the global warming/cooling

predictions make the most sense (if any at all). Conditions are continually changing and no prediction is more than a guesstimate limited by ignorance. Glib claims and answers can be fatal! The need to keep re-assessing is hugely important for everyone's future.

Our 300 chart is still in process of construction. Many historical items are yet to be added. Eventually you will see the whole panoply of the average sunspots from 1000 to 2020 (annual averages prior to 1749, monthly thereafter) on one page. When we can find good "series" numbers for the Grand Solar Minimum prediction numbers, we will add these into this chart. Ditto the first part of the Second Millennium. We will add "derivative" sunspot numbers calculated from acceptable "proxy" series to finish the entire panorama of the Second Millennium.

We feel it is important to have a consolidated and detailed point of view of history in Super Charts to get the best possible overview to form our opinions. Scientists look at different parts of world history and come with different visions of what the numbers should be. Thus there are various different points of view about what the future holds for the Sun and the Climate during the next few decades. The Super Chart provides a matrix in which you can make your own choices.

Our fundamental objectives are

- a) Demonstrate that long term **solar cycles create major climate shifts which alternately cool and warm the Earth** for eras which are many decades and sometimes centuries long; demonstrate that the cyclical changes are not exact in timing and sometimes create unpredictable results.

- b) These **climate shifts have driven the major changes in human**

history for as far as we can see into the distant past. This Super Graph names the biggest shifts and provides scenario pages to describe them which are linked into these pages to depict "the missing part of the story of human history". With this knowledge, all people will be more able to devise suitable plans for adaptation and survival.

c) Create a **learning and teaching matrix** for everything about the Sun to enable people to properly observe, interpret, and respond to solar activity and trends. Especially the young who have been badly mis-informed by a generation of environmental extremism and propaganda grift operations.

On This Chart

What Are Sunspots?

Visible Dark Spots: The dark spots actually are full of light but they are "outshone" by the surrounding solar surface. Thus they appear dark as an optical illusion. Being dark, they have less ionic plasmic energy than the surrounding surface but they have intense concentrations of magnetic energy. Essentially, these spots can be thought of as spiraling "hurricanes" of magnetic energy. Huge and very intense hurricanes of spiraling magnetism. Naturally, knowing only what could be seen at the time, early counters, even in ancient China, began to simply refer to them as Sunspots. Beyond this, the conversation gets very specialized in advanced astrophysicist talk. For entry to that, click on [BRIEF](#).

What Is Being Measured?

Sunspots: The dark spots appear and disappear on the Sun in

repeating but always changing sequences. They are chaotic, but group together in various patterns. They come in bursts and fade away, typically in less than a month. They also come in "seasons" which are called solar cycles of about 11 years. We call them Sun Cycles. Perhaps they should be called Sun or Solar Years. There is a "sun or solar winter" with no or close to 0 sunspots and there is a "sun or solar summer", which can sometimes hold 500 sunspots at one time for a few days or so. Rarely are daily counts used because these fluctuate greatly from day to day.

Usually these "counts" are summed up to define an average number for each month. These average numbers are EXCEPTIONALLY IMPORTANT FOR UNDERSTANDING WHAT HAPPENS ON THE SURFACE OF PLANET EARTH. For access to the entire history and industry of sunspot counting, click on [BRIEF](#).

Solar Activity: The sunspot counts also, IN A SENSE, measure many other behaviors/activities of the Sun. More precisely, the magnitudes of many other major physical activities of the Sun vary in synchronicity with the Sunspot Cycles. The intensity of light, the density and speed of the solar wind, the flood of ions from flares and solar storms, the wavelengths of energy from the sun, all this shifts together with the Sunspot Counts. This is easily seen in the "Solar Cycle Variations chart below. When one is up, the others are as well. This complex mix of energy pouring out from the Sun in harmony affects A GREAT MANY THINGS ON THE EARTH, including all aspects of agriculture, space exploration, satellite operations, ocean currents, weather gradients, storm tracks, even, believe it or not, some aspects of economic and political activity. This is why solar scientists are measuring as much as they can, as assiduously as they can. This is why the Count is SO IMPORTANT, even though humanity does not

yet understand how to make use of most of it.

Correlation of Solar Outputs With Sunspot Counts

Okay, hey wait a minute! So how do we know, really, that the Sunspots really have an effect on the Earth's climate? That's a fundamental question, is it not?

There are three simple answers.

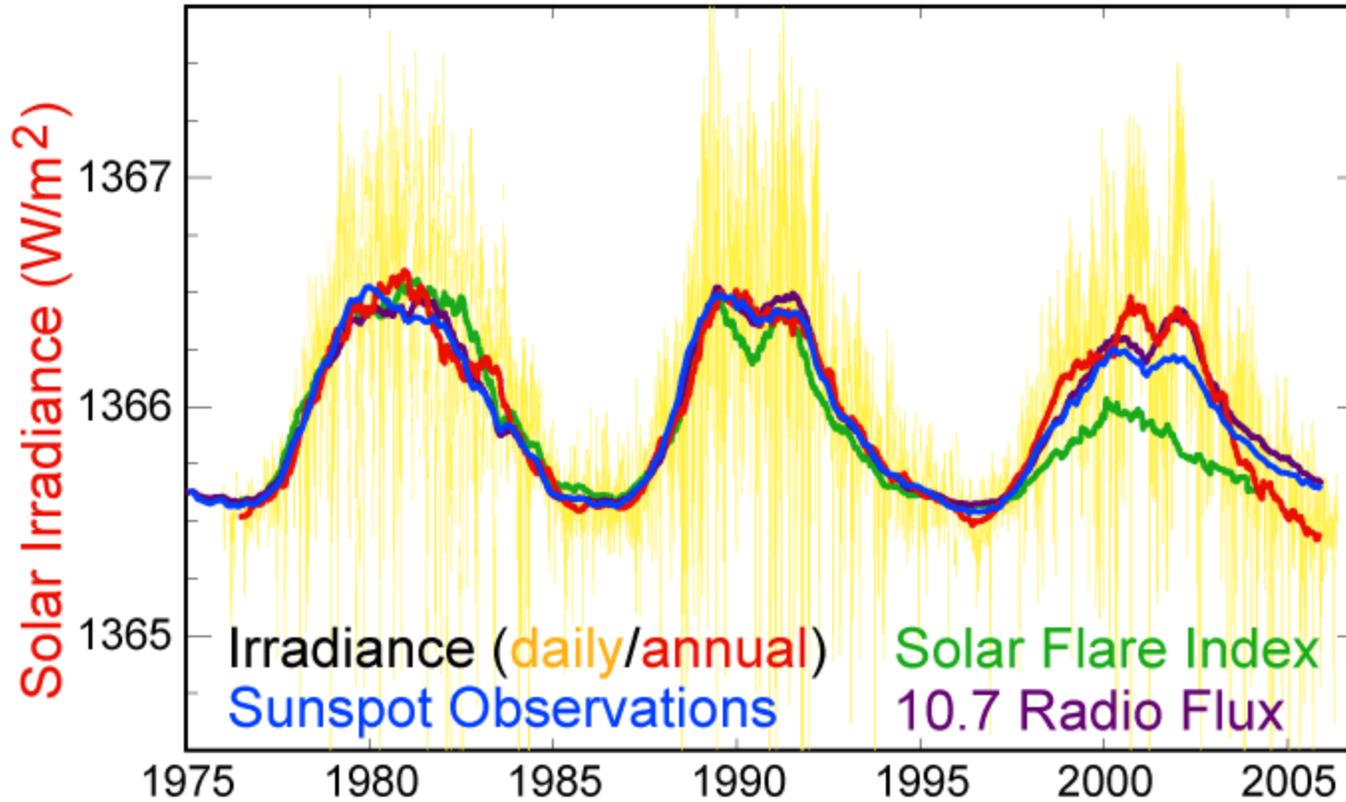
First, the Sunspot Count is a proxy of all the energetic activity of the Sun. It is not the Sunspots which affect the weather, it is the whole harmony of solar energy which accompanies the Sunspots which affects the weather.

Second, historical records for the past 300 years prove the Sunspot proxy is reliable and that it in fact directly correlates with good or bad climate conditions. Understand this point. We know NOT FROM THEORY, we know from FACTS. This is called empirical science, it always trumps theory.

Third, high science can now read chemical changes in many things which respond directly to higher or lower levels of Sunspots. If a date can be established for the creation of certain materials, the Sunspot Count during the formation of that material can be directly stated.

Let's tackle the first point by looking through this graph directly below.

Solar Cycle Variations



Correlation of Solar Outputs With Sunspot Counts Continues

The Solar Variations Chart (above) show the last triple-play of a very energetic Sun (Sun Cycles 21, 22, & 23). The chart demonstrates

quite nicely how the observable outputs of the Sun track together fairly neatly in their rise and fall.

Irradiance (the light spectrum both visible and invisible) increases and decreases with the Sunspot Count. The numbers of Solar **Flares** likewise expand and shrink with the Sunspot Count, as does the "**Radio Flux**". The measurement of the density of the Radio Flux is a direct indicator of the EM power (electromagnetic, i.e. the flow of electrons) in the Solar Wind.

The satellite solar observatories in orbit now also record the **wind speed** (which varies greatly like the wind speeds of air on Earth). This is another indicator of how much actual energy is being transferred to Earth. An increase in Flux and speed almost always precedes Sunspots by a day or so.

High Flux counts typically create a huge increase in **Auroras** (glowing colors of ribbon-like plasma showers) in Earth's atmosphere. These demonstrate a major connection directly between activity in the Sun and the Earth's atmosphere. It shows how readily solar activity changes activity in Earth's atmosphere.

And then there are **solar storms** and the **Coronal Mass Ejections** which sometimes are lobbed directly at the Earth. CME's are huge "rivers" or "plumes" of hydrogen protons, electrons and other ions. They strike the Earth like bolts of lightning strike trees. Their strength and size vary greatly but at least two of them in the past 200 years have been directly responsible for burnouts in the electrical power lines on Earth.

The canvas of solar outputs is larger than this little discussion, suffice it to say that generally these outputs are far greater during the active

years of a Sun Cycle than it is at its minima (bottom).

Currently, Alarmist propaganda often claims that the change in the visible light spectrum is too small to effect the temperature of the Earth. People who make this claim are talking without awareness of what the Solar Output really is, they are oblivious, really, about the complexity of the rivers of energy which are streaming towards the Earth and the complexity of its effects on the air, water, and Earth itself..

Correlation of Sunspot Counts With Earth's Climate

That was pretty simple, let's deal now with the two remaining issues. They are equally simple.

What the energy transfer connections are between the Sun and the Earth is a complicated high physics problem which defies a solution with one dimensional simple math vectors.

Okay not to worry. We wrote that line for nerds. Fortunately, most of us can solve the problem simply by looking at empirical evidence in the annals of human history. We look at the **NET RESULT** of the equations, we will leave the equations for the nerds.

Enough is in the ground and in human historical accounts to outline the correlation with no doubt. Enough chemical changes are in layers in the ground, in the tree rings, in the ice layers, and maybe others sources, which tell us the approximate years during which Solar Activity was increased or diminished.

These tattletales are usually C14 readings or readings of other isotope shifts. The numbers are called "proxies" of Sunspot Counts. By careful comparisons with correlations of the past 300 years to establish how to infer the Sunspot Count, proxies now can be used to leapfrog through thousands of years and define the entire Holocene age, especially the last 6000 years.

This is an incredible opportunity to change our understanding of both climate change history and human history. Numbers constructed for thousands of years can be used to directly infer what the Sunspot Count PROBABLY was. The rest is just correlating the responses in the Earth and with the annals of human history. Keep in mind, however, that these correlations are usually not exact, there is always some imprecision in the numbers. In fact, there are studies which have done to calculate the amount of imprecision which you can expect by different methods.

Okay, with that understanding, you now can read the lines in this Super Chart and many other graphs by other people with the understanding you are also reading the history of climate changes and many other changes in the Earth and humanity.

Now this whole exploration get fun and vastly more interesting.

Interpretations Of The Lines

Red Line Jiggly: This is average monthly Sunspot Count. It is the average daily count for each month. As can be seen solar activity is highly unstable, seemingly, at the daily level. Sunspots can suddenly (within two or three days) double, triple, or even quadruple in

numbers. Planetary alignments greatly influence this activity.

Black Line Solid: This is the smoothed average monthly Sunspot Count which has been smoothed by averaging with the previous 13 months. This provides a better grasp of the overall level of solar activity for any given month or year.

Black Line Dotted: This is the projected average monthly Sunspot Count for the entry into Solar Cycle 25 from the SIDC-SILSO Standard Curves model, which is one of four major alternative prediction models.

Orange Line Flat: This is the magnitude level of 150 Sunspots. This number is arbitrary but very convenient for looking at the various periods of high solar output for the past nearly 300 years. It defines the length of Solar Maxima and shows how variable the cycles really are. Notice that the highs do not vary nearly as much in time duration as do the lows below the Blue Line.

Green Line Flat: This is magnitude level of 100 Sunspots. This brings in the focus of a modest Sun Cycle. Do we find more "average weather" under such suns? And what is the weather like with the others? There is a lot of creative and fun research which could be done with this notion.

Blue Line Flat: This is the magnitude level of 60 Sunspots. This number is arbitrary but very convenient for looking at the various periods of low solar output in past centuries. It defines the length of Solar Minima and shows how variable the cycles really are. Some are quite wide some very narrow. This probably correlates well with micro climate change.

The Primary Sun Cycle is most often called the solar cycle, the Sunspot cycle, or the Schwabe cycle with a mean periodicity of 11 years. We are calling it the Sun Cycle. By computing the average monthly Sunspot Counts and displaying them on a graph, immediately the 11 year cycles become apparent. As can be seen in the chart, sunspots rise and fall in their numbers, ranging from near 0 to as high as about 400, in a regular but somewhat variable eleven year cycle which can be as long as 14 years or as short as about 7.5 years. Daily outbreaks of sunspots can even go over 500, but these numbers cannot be seen in the Super Chart above because the red line numbers are monthly averages, not daily counts.

Sun Cycle Numbers: Beginning in 1751, each of these sun cycles were given a number and scientists are still using this scheme. As of August 2019, we are just about entering Sun Cycle 25. For more details and dates of the cycles, see the Sun [BRIEF](#).

Major Sun Cycles:

There are many other cycles in the Sun which show up in the rise and fall of the average size of the Sunspot Counts. These can vary greatly in duration and magnitude, at least one cycle exists which can wipe out Sunspots for many decades, such as the cycles which produce the Grand Solar Minima.

These cycles are of great importance for both humanity and Earth's entire ecology. The Sun is an immense complex ocean of extremely powerful energy processes, most of which we cannot see. Most likely there are many processes and cycles we still know nothing about and cannot even measure. These processes are creating many rhythmic effects on the surface and in the interior of the Sun which are always

moving and changing.

Unfortunately we could not get close enough to follow them in detail until about 15 years ago. We still know very little about the mechanisms at work in this ocean of energy, but we have been able to define a few cycles which scientists around the world are now studying in detail.

The global warming debate greatly stimulated many of the world's scientists to observe and define solar cycles and how they influence Earth's climate changes (cycles). We can now see our way forward with greater perceptive acuity and mental understanding about the real trends which are shaping both our immediate and our long-range futures.

A small number of scientists have discussed for many decades various cycles in the rise and fall of the size of the sunspot counts or the amount of change in various isotopes and chemicals which can be analyzed year by year in the layers of sediments and glacial ice. Based on research since the 1960's, several distinct cycles can be seen through the lens of the physical sciences. Some of these cycles are visible in the Super Chart above. More information about more cycles is available in the [Gallery](#).

22 Year Solar Polar Reversal Cycle: Every other 11 year Sunspot cycle reverses the magnetic polarity of the Sun.

88 Year Gleissberg Cycle: This cycle is unstable and hard to follow because of lack of consistency. It is not widely studied or discussed. Can you spot in the Super Chart above a pattern which seems to repeat about every 90-110 years or so?

200-208 Year Suess Cycle: The cycle is stable enough to see as sudden plunges in activity, such as in the Dalton Minimum (see below). Can you spot some peaks and bottoms in the Super Chart lines which show this repeating pattern?

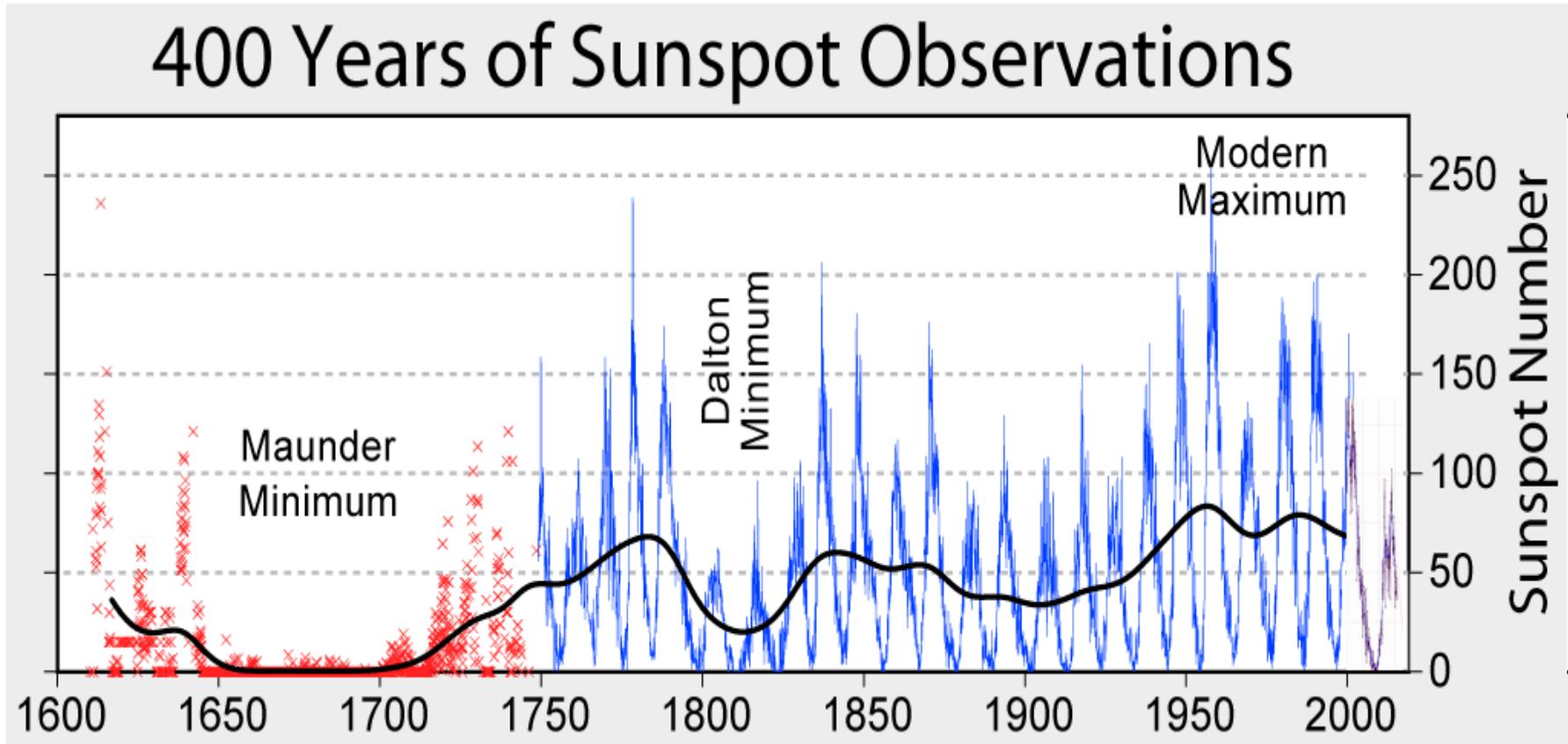
350-400 Year Grand Solar Minimum: There is some instability in this cycle but the magnitude of shift in solar activity makes it clearly visible. Other than the 11 year cycle, this is the most important cycle because occasionally it virtually extinguishes for several decades our regular 11 year cycle of solar activity.

As historians look backward in time through this lens, they are rapidly concluding that the greatest shifts in human history have been produced by this long "Grand Cycle". During the past few years, Zharkova et al have shown how this cycle repeats through time, sometimes adding to other cycles and sometimes overwhelming the other cycles. Since we could not add numbers to the Super Chart at this time to show the era of the last Grand Solar Minimum, we incorporated a Wiki graph below which displays it, along with details which describe it

2000 Year Super Grand Solar Minimum: This takes a super-powered statistical telescope to spot, but scientists have some images and numbers for it. Zharkova et al have recently demonstrated that this cycle modulates the Grand Solar Minimum cycle making it occasionally more extreme and then of course occasionally more moderate. We are very lucky, according to Zharkova, that this cycle is currently working to increase Solar Activity and so it will moderate the Grand Solar Minimum phase we have begun to enter into and make it less severe than the last Minimum Phase.

The Little Ice Age, The Grand Solar Minimum, and the Dalton Minimum

The primary eras of greatest interest can be easily seen in this condensed chart.



CC BY-SA 3.0 [Source](#)

Source of Data: see below at the bottom of this page. This chart was compiled and placed on [consistent monthly framework](#) by Hoyt & Schatten (1998a, 1998b). They used the data at the Solar Influences Data Analysis Center,

The 70 - 100 Year Maunder Minimum

(1645-1715) + ~8 years for duration of ocean thermal mass recovery

As can be seen in this 400 year chart, it goes about 150 years further into the past where our Super Chart does not. Our expanded 300 Year Super Chart starts in the year 1749 at a time when the Sunspot Counts have already completely recovered from the Maunder Minimum.

Most people describe the Maunder Minimum as beginning in 1645, which is about the point where solar activity was no longer or was just barely observed on the Sun most of the time. The ending is described as being in 1715 just after an initial but still small flurry of solar activity. This defines a 70 year window.

More realistically, the recovery period in the climate took longer. The oceans require approximately 8 years to recover their average temperature. This adds about an additional 11 year Sun Cycle to the time frame of harsh climate conditions.

All combined in total, the Maunder Minimum cold climate era can be described as about 8 Sun Cycles of about 90 years.

For a Profile of climate and weather conditions and how these impacted people of those times, go to [Cold Sun Profile: Maunder](#)

[Minimum.](#)

The Little Ice Age

(1300-1850)

The Maunder Minimum is the bottom or low phase of the Grand Solar 360-400 Year Cycle. On either side of this low phase we can see a high phase, which persisted for hundreds of years.

But there were and are other cycles at work which interfere with this Grand Solar Cycle. Thus we can find a lot of instability in the trend lines on both sides of the Maunder Minimum Phase.

[Since we do not have a chart of the early part of the second millennium at the moment, we will ignore the period from 1000 to 1600 for the time being except to note that there were two exceptionally difficult periods during that span for Europeans which were similar in length but much deeper than the Dalton. The two minimum periods were the **Wolf Minimum** in the 1300s and the **Sporer Minimum** in the 1400s. Some researchers define both of these solar minimas as part of the Little Ice Age.]

The **Dalton Minimum** is also defined as being part of the Little Ice Age time span. This gives a total stretch of about 550 years for the **Little Ice Age**. Based on scattered stories, one can imagine a 500 year winter saga comprising four deep, long, cold minimas but that is complete fantasy. After the Maunder Minimum dissolved with rising Sun Cycles growing ever larger in the following decades, the European Dynasties developed rapidly by embarking on worldwide empire building focused on international trade of monopoly controlled commodities.

The Initial Rise of the Industrial Maximum:

From about 1725 to about 1790, for about 60 years, solar activity rose consistently with each solar cycle. Empire building was rapid and the institutional basis for industrialization began to be created. But this rise was abruptly disrupted by the Dalton Minimum.

The Dalton Minimum

(1790-1830)Wiki

By 1795, the Sunspot Count fell below the Cold Line in the Super Chart and did not recover until 1826 with a typical Sun Cycle which would rise above the Moderate Line . This took 2 small but long Sun Cycles plus the leading edge of a third, about 30 years all in all. During this time, solar activity rose only slightly above the cold line for only seven years.

For a Profile of climate and weather conditions and how these impacted people of those times, go to [Profile Dalton Minimum](#).

Completion of the Industrial Maximum:

From 1826 through to 1964, a long Maximum Phase of the Grand Solar Cycle bought a long run of the greatest solar outputs of the second millennium.

This era was marked by a warming phase in the climate, as has happened many times in the past. During this long-run of favorable climate, the inventive spirit of humanity wrought great transformations in human technology, economics, education, society, government, and

mass culture.

All this, along with humanity's atavistic qualities, also brought greater confusion, conflict, doubt, and dissension than ever before.

And so it is that we stand here at the current Global Warming Debate on the edge of titanic forces of change that we scarcely can comprehend.

Okay, so what's next?

Does any of this do anything for us? Rumors abound, the world is abuzz with stories of Global Warming catastrophes on one web page and then stories of Global Freezing on another. How does this Super Chart tell us anything, and if it does, what does it tell us?

The Eddy Minimum

(proposed name)

What's next is the recurrence of the Grand Solar Minimum, which repeats about every 350 to 400 years. The time is up. It has been 374 years since the beginning of the last Grand Solar Minimum also known as the Maunder Minimum.

It's here! Some are expecting to start in 2020, others are proposing 2025 or 2030 as starting dates. But since the Cold Line does an excellent job of revealing depressed solar cycles, we say its already

been here and has been here for nigh on 4 years, since 2016. It fits the graph curves quite nicely and it also fits the development of increasingly extreme and weird weather. There has no doubt been major interference for the past few years in the historical season patterns and the traditional patterns of wind and monsoon. This is a worldwide complaint which urban dwellers know little about but which those in agricultural zones are highly concerned about.

We refer to it here as the Eddy Minimum because some solar scientists are proposing it to honor a pioneering solar scientist, John Eddy, who was the first solar scientist in the 20th century to document that the Sun is a variable star which produces dramatic climate changes. He first indentified the various Solar Minima (Sporer, Maunder, Dalton, and others) as directly connected with major climate/weather changes.

The **Eddy Minimum** is variously predicted as follows:

(2025-2055)Z = Zharkova et al

Already onsetting a cold period similar to the Dalton Minimum but generally milder. A progressive onset which reaches bottom about 2035 and begins a slow recovery from about 2055. Then a long rise to a Super Grand Cycle warm period some 500 years in duration which may increase average temperatures by perhaps 2.5 degrees C.

(2025-2095)EB = Easterbrook

A long deep cold era which is onsetting now and which will reach bottom in the 2040s. Recovery will take nearly a century.

(2016-2096)MWM = Mandeville
(70 years + 8 yr recovery)

This is a composite, basically a Zharkova profile with the addition of the current onset phase and a much longer recovery period for the recovery of the ocean thermal mass to the historical level circa 2008.

(2030-2100)E = to be completed

These scenarios get complicated to explain. But now you are ready to track them down in

the [Gallery](#) and in [Predictions](#)

Source of Data For This Chart

(and others composed directly for Solar-Cycles.com)

The International Sunspot Number is calculated by an international consortium of research institutions which use an elaborate scheme of observations and mathematics to define a consensus number to

continue defining a "series" of daily counts which began over three hundred years ago. This and much other data about the Sun is coordinated and archived at the Belgium Royal Observatory in Brussels. The main title for the archive is the "Sunspot Index and Long-term Solar Observations".

The main access to the archives is through:

<http://www.sidc.be/silso/datafiles>

The "series" of numbers which define the daily sunspot counts are not complete prior to the 19th century. Some months and even years were not logged consistently. Prior to 1749, the inconsistencies are even greater making monthly averages impossible. So, for these periods the "averages" are based on less than a full deck of daily cards, which only became consistently full from 1849 onwards. Many points of evidence have been considered by various researchers to ensure that the numbers they have come up with connect with reality. This has gained credibility during the past dozen years with the discovery and proof that many "proxies" provide a realistic method for defining the solar sunspot activity during any given year. These proxies can be found in chemical analysis of mud, ice, and trees anywhere on the Earth. Typically the "proxies" are shifts in the chemical bondings and elemental isotopic variations in the ice, sediments, or tree rings.

So, for the years 1749-1849, the Sunspot Count is mathematically constructed by filling in the blanks between the numbers which were recorded. After that, the average and smoothed numbers are computed from the Daily Count, which is communicated around the world on a daily and monthly basis. Look here for the report bulletin of August 2019 to see the typical report and numbers. From these numbers, predictions are made about the level of Sunspot Activity on

the Sun for the following months and years. Look in Gallery for typical predictions.